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CANADA: FARM FUEL AND FERTILIZER EXPENSES

World petroleum prices reached record highs in 2006, resulting in higher prices for farm fuel and fertilizer. For 2007, fuel prices are forecast to decline but fertilizer prices are expected to continue to increase. This issue of the *Bi-weekly Bulletin* examines the situation and outlook for farm fuel and fertilizer expenses in Canada for 2006 and 2007.

In 2006, the Canadian agricultural sector experienced major increases in machinery fuel and fertilizer costs. Fuel prices in Canada reached record highs due to the slow growth of crude oil supplies relative to the strong growth in international demand and continued international political uncertainty caused by things such as instability in the Middle East and unrest in Africa's biggest oil producer, Nigeria. Fertilizer prices increased due to tight supply relative to demand and higher energy prices.

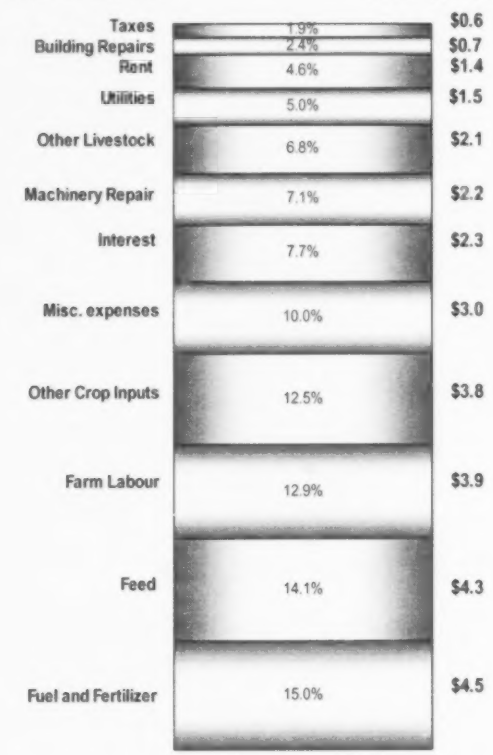
In 2007, fuel prices are forecast to be lower than in 2006 but fertilizer prices are expected to continue to increase due to the continuation of tight supply relative to demand.

Figure 1 shows the components of 2005 Canadian farm operating expenses. Fuel and fertilizer costs accounted for 15% of total Canadian farm expenses, or CAN$4.5 billion (bln). For every one cent per liter increase in fuel prices, Canadian farmers' annual machinery fuel bill is estimated to increase by about CAN$28 million (mln). For fertilizer, every one cent per kilogram increase in the price adds about CAN$61 mln to Canadian farmers' annual fertilizer bill.

Figure 1

CANADA: FARM OPERATING EXPENSES (2005)

Source: Statistics Canada



FARM FUEL EXPENSES

Fuel for farm machinery consists mainly of diesel and gasoline but also includes lubricants. The price of fuel is generally determined by the forces of supply and demand worldwide. The agricultural sector is a price taker for both diesel and gasoline.

Fuel Prices

The world demand for oil is rising, driven by continued economic growth throughout the world, crude oil suppliers and oil refineries struggle to keep pace with the demand. Under these conditions, any disruption, such as Organization of the Petroleum Exporting Countries (OPEC) production decisions, hurricanes, instability in the Middle East and other international political and economic uncertainty, could result in higher fuel prices. *Figure 2* shows that energy prices in the US and Alberta increased sharply during 2006. The West Texas Intermediate (WTI) crude oil price averaged US$66 per barrel in 2006, 17% higher than 2005.

The Canadian agricultural sector relies heavily on fuel to meet a variety of energy needs. It was also subject to a substantial increase in prices, as Canadian input prices closely follow the US energy market prices. Agriculture and Agri-Food Canada (AAFC) estimates that the prices paid by Canadian farmers for farm machinery fuel rose by about 6% in 2006 from 2005. This translates into about a CAN$112 mln increase in Canadian farmers' machinery fuel bill for 2006.

In 2007, unseasonably warm winter weather, above-normal inventory levels and higher spare oil production capacity driven by the production cuts by OPEC countries are likely to help moderate upward fuel price pressures. The US Energy Information Administration (EIA) forecasts the price for WTI crude oil to average US$59 per barrel in 2007, 10% below the 2006 average. Diesel prices are projected to show a 4% decrease while gasoline prices are forecast to decrease by about 9% in 2007. Assuming that the Canadian dollar will depreciate slightly in 2007, AAFC expects farm machinery fuel prices to be down by about 2% for 2007 in Canada.

Farm Fuel Usage

Due to higher fuel prices, Canadian farmers aren't buying as much fuel as when prices were lower. *Figure 3* indicates a negative relationship between fuel price and fuel usage. The estimated correlation between them is about -0.7. For example, fuel usage decreased by 8% when fuel prices increased by 31% in 2000, and fuel usage increased by 7% when fuel prices decreased by 17% in 2002.

Elasticity is a concept used by economists to gauge the responsiveness of demand or supply to changes in price. Using 25 years of historical data from Statistics Canada, the elasticity of demand for the price of fuel was estimated at -0.18 at the Canada level. This means that, on average, when fuel prices rise 10% Canadian farmers reduce fuel usage by 1.8%. Fuel usage is relatively insensitive to price changes.

Figure 4 indicates that farmers' fuel usage was actually quite steady with fuel prices fluctuating at around 1.6 (base year=1980) over the 1981-1999 period. But, the volume of fuel used by farmers was down by 9% in 2001 and continued to fall to over 20% in 2003, following a string of continuous hikes in fuel prices after 1999. Therefore, we can conclude that although higher fuel prices do have some effect on farmers' fuel usage in one year as described by the fuel price elasticity, they would have to stay high for a relatively long time in order to reduce the fuel consumption trend. In response to higher fuel prices, farmers alter their technique of production. For example, if the fuel prices were to stay high for a relatively long time, farmers might choose more-efficient tractors, combines and other farm equipment, or it might be advantageous for farmers to reduce tillage or the number of trips across the field by combining operations to save fuel.

Based on changes to factors such as seeded/harvested area and the fuel price elasticity, AAFC estimates that Canadian farm machinery fuel usage for 2006 was unchanged from 2005 and is forecast to increase by 1% for 2007.

Due to the change in both price and quantity, Canadian farm machinery fuel expenses are estimated to reach CAN$2.09 bln, an increase of 5.6% in 2006 over 2005, and then forecast to decrease by 1.3% in 2007.

FARM FERTILIZER EXPENSES

Canada is one of the world's major fertilizer producers, particularly for nitrogen and potash. Canada exports about 95% of its potash production and about one-half of its nitrogen products, mainly to the United States. Canadian fertilizer production is primarily located in Alberta and Saskatchewan.

Major Fertilizer Types in Canada

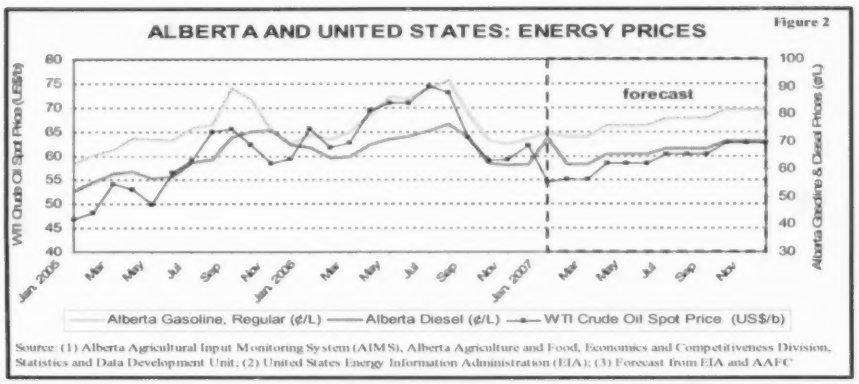
Nitrogen fertilizer is the largest nutrient used in crop production in Canada. About 65% and 51% of the fertilizer used by farmers in Western Canada and Eastern Canada, respectively, is nitrogen fertilizer. Phosphate fertilizer accounts for 26% and 15% of total fertilizer usage in Western Canada and Eastern Canada, respectively. Potash fertilizer accounts for 23% of total usage in Eastern Canada, which is mainly used in the production of soybeans. The remaining fertilizers account for a small percentage of the total.

The phosphate fertilizers that are currently used in Canada are mainly diammonium phosphate (DAP) and monoammonium phosphate (MAP) which are produced from rock phosphate. The other nutrient used in crop production is potash fertilizer. Most potash deposits in North America are found in Canada, especially, Saskatchewan.

Fertilizer Prices in Canada – U.S. Border Area

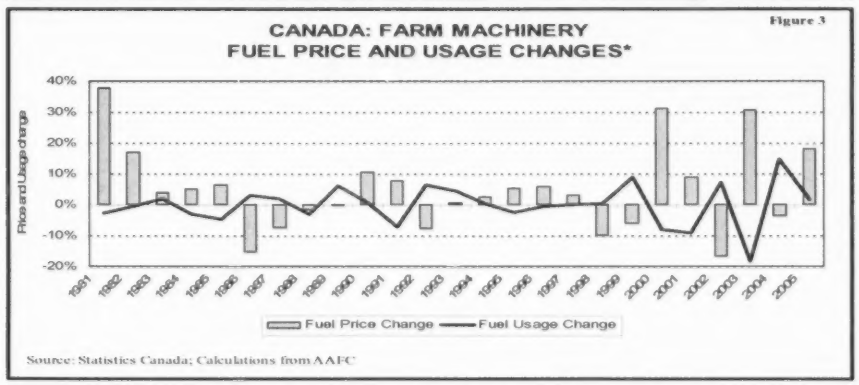
The fertilizer market is global in nature and the North American fertilizer market is completely open and integrated. As a result, Canadian fertilizer prices are linked to the U.S. market. *Figures 5* and *6* show the retail price differences of fertilizer between Canada and the U.S. border area.

Figure 2


ALBERTA AND UNITED STATES: ENERGY PRICES
WTI Crude Oil Spot Price (US$/b)
Alberta Gasoline & Diesel Prices (¢/L)
forecast
Jan 2006
Jan 2007
Alberta Gasoline, Regular (¢/L)
Alberta Diesel (¢/L)
WTI Crude Oil Spot Price (US$/b)

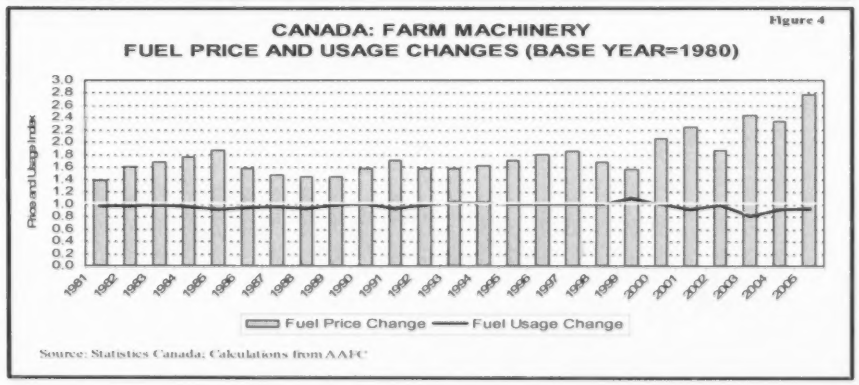
Source: (1) Alberta Agricultural Input Monitoring System (AIMS), Alberta Agriculture and Food, Economics and Competitiveness Division, Statistics and Data Development Unit; (2) United States Energy Information Administration (EIA); (3) Forecast from EIA and AAFC

Figure 3



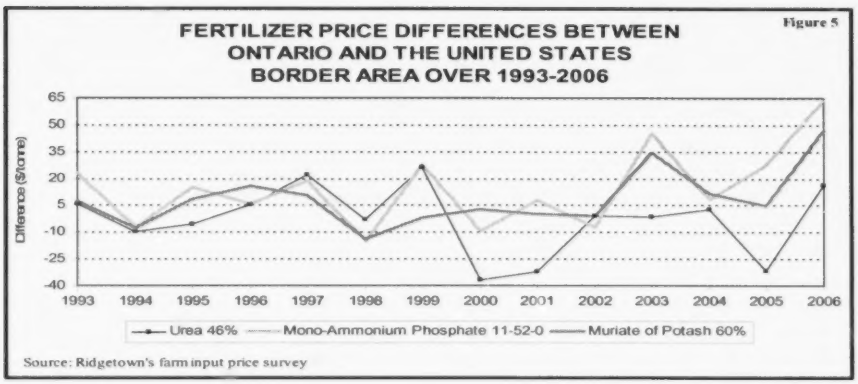
Source: Statistics Canada; Calculations from AAFC

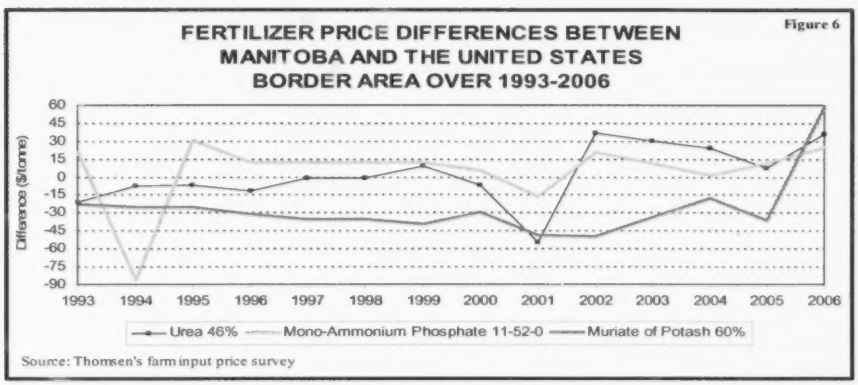
Figure 4

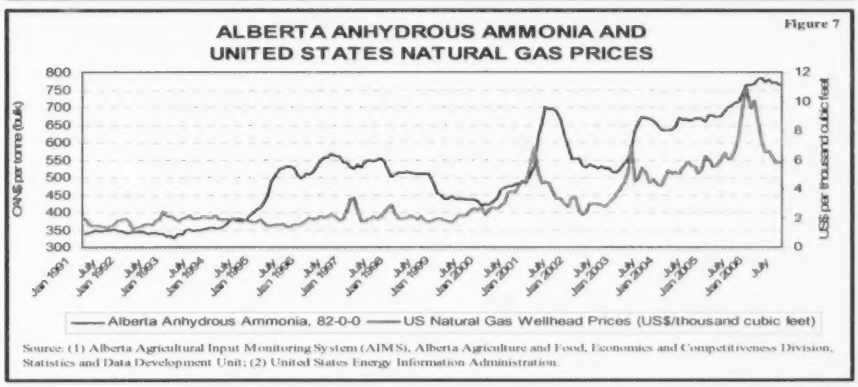

CANADA: FARM MACHINERY
FUEL PRICE AND USAGE CHANGES (BASE YEAR=1980)
Price and Usage index
Fuel Price Change
Fuel Usage Change

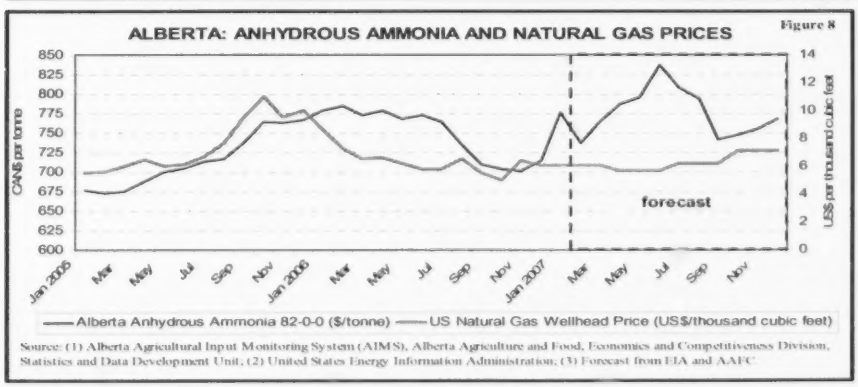
Source: Statistics Canada; Calculations from AAFC

Statistical analysis has confirmed that average fertilizer prices in Canada and the U.S. border area were not statistically different for urea, mono-ammonium phosphate and muriate of potash over the 1993-2006 period. The average price difference between Ontario and Michigan/Ohio/Indiana was CAN$-3.10/tonne (t) for urea, CAN$16/t for mono-ammonium phosphate (11-52-0), and CAN$8.40/t for muriate of potash over the 1993-2006 period. Thus, urea prices were a little cheaper in Ontario while phosphate and potash prices were slightly higher than the U.S. border area from 1993 to 2006. Similarly, the average price difference between Manitoba and Minnesota/North Dakota was CAN$0.30/t for urea, CAN$3.50/t for mono-ammonium phosphate, and CAN$-24.50/t for muriate of potash over the 1993 to 2006 period. The urea prices observed were almost the same in Manitoba as in the U.S. border area over the past 13 years.






ALBERTA ANHYDROUS AMMONIA AND UNITED STATES NATURAL GAS PRICES
Figure 7
CA$ per tonne (bulk)
US$ per thousand cubic feet
Alberta Anhydrous Ammonia, 82-0-0
US Natural Gas Wellhead Prices (US$/thousand cubic feet)
Source: (1) Alberta Agricultural Input Monitoring System (AIMS), Alberta Agriculture and Food, Economics and Competitiveness Division, Statistics and Data Development Unit; (2) United States Energy Information Administration.


ALBERTA: ANHYDROUS AMMONIA AND NATURAL GAS PRICES
Figure 8
CA$ per tonne
US$ per thousand cubic feet
forecast
Alberta Anhydrous Ammonia 82-0-0 ($/tonne)
US Natural Gas Wellhead Price (US$/thousand cubic feet)
Source: (1) Alberta Agricultural Input Monitoring System (AIMS), Alberta Agriculture and Food, Economics and Competitiveness Division, Statistics and Data Development Unit; (2) United States Energy Information Administration; (3) Forecast from EIA and AAFC

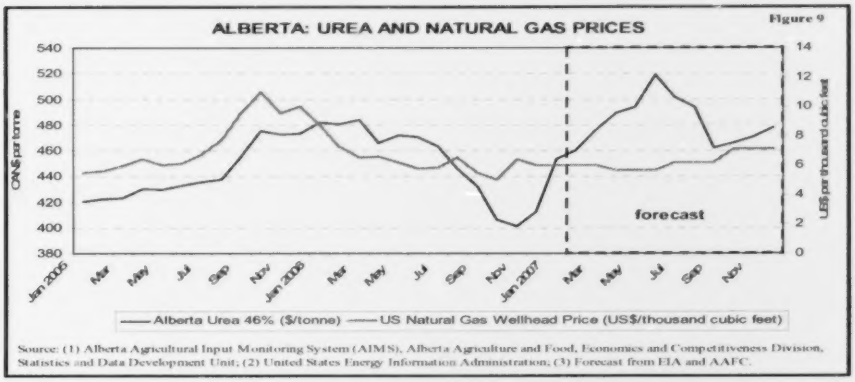
Fertilizer Prices and Natural Gas Prices

Anhydrous ammonia is the source of nearly all the nitrogen fertilizer produced in the world. Ingredients for the production of anhydrous ammonia are air, natural gas and steam. Natural gas accounts for 70-90% of the production cost of ammonia. Therefore, nitrogen fertilizer prices should be very responsive to changes in natural gas prices. *Figure 7* illustrates that fertilizer prices generally track natural gas prices.

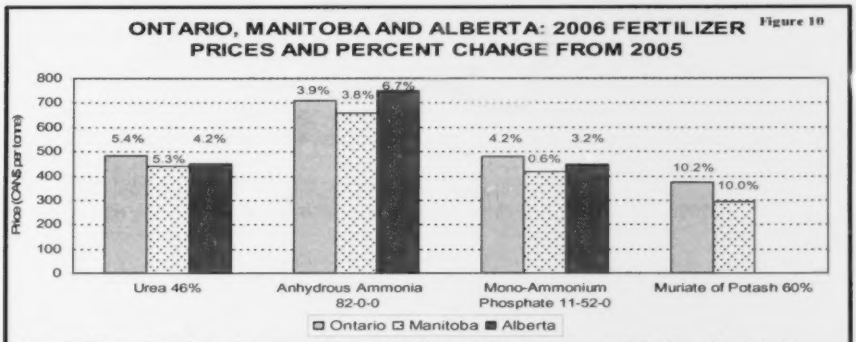
The correlation between the price of natural gas and the price of fertilizer was estimated at 0.80 based on 16 years of monthly data. As natural gas prices increased, nitrogen fertilizer prices increased in a similar fashion. This tight relationship, however, does not always hold. In the mid-1990s strong fertilizer demand, in combination with near-full industry capacity utilization, kept fertilizer prices high despite low natural gas prices.

Figures 8 and *9* highlight more closely how fertilizer prices followed natural gas prices in Alberta over the 2005 and 2006 periods. The average anhydrous ammonia price increased 2.1% in Alberta due to higher prices for natural gas. Since urea is commonly produced using anhydrous ammonia, the urea price followed a similar pattern and increased by 4.7% in 2006.

In addition to the impact of the higher price for natural gas, the price of fertilizer is also affected by the higher prices for gasoline and diesel because they represent part of the cost of marketing fertilizer. Higher fuel prices increase the transportation component of fertilizer prices at the retail level. However, the price of fertilizer is much more dependent on the price of natural gas than the price of fuel.


ALBERTA: UREA AND NATURAL GAS PRICES
Figure 9
CN$ per tonne
US$ per thousand cubic feet
forecast
Alberta Urea 46% ($/tonne)
US Natural Gas Wellhead Price (US$/thousand cubic feet)

Source: (1) Alberta Agricultural Input Monitoring System (AIMS), Alberta Agriculture and Food, Economics and Competitiveness Division, Statistics and Data Development Unit; (2) United States Energy Information Administration; (3) Forecast from EIA and AAFC.



Source: (1) Ridgetown's farm input price survey; (2) Thomsen's farm input price survey; (3) Alberta Agricultural Input Monitoring System (AIMS), Alberta Agriculture and Food, Economics and Competitiveness Division, Statistics and Data Development Unit.

As a world market commodity, fertilizer prices are also determined by supply and demand factors. Increased demand for fertilizer has played, and will continue to play, a large part in placing upward pressure on fertilizer prices. Tight fertilizer supply has also played a part in driving up fertilizer prices, as a small increase in new global production capacity has been more-than offset by some plant closures.

Figure 10 shows prices of the major types of fertilizer as well as the percentage changes in price in 2006 as compared to 2005 in Ontario, Manitoba and Alberta. AAFC estimates that the average prices paid for fertilizer in Canada increased by 3.9% in 2006 due to tight supply/demand fundamentals and higher energy prices. The 3.9% increase in fertilizer prices translates into about a CAN$99 mln increase in Canadian farmers' 2006 fertilizer bill.

In 2007, natural gas prices are forecast to be almost flat by the United States Energy Information Administration, which should moderate upward fertilizer price pressure. However, the rapidly growing production of biofuels is beginning to alter world demand patterns for crops used to produce biofuel. For example, area planted to corn in the United States is expected to significantly increase from 2006-2007 as a result of growing demand for ethanol. Increased corn production will require large amounts of fertilizer. The International Fertilizer Industry Association (*World Agriculture and Fertilizer Demand, Global Fertilizer Supply and Trade 2006-2007* by Patrick Heffer & Michel Prud'homme, January 2007) noted that the strong increase in demand for fertilizer in North America for 2006-2007, relative to other regions such as South Asia and East Asia, will tighten-up the supply/demand fundamentals in 2007. *Figures 8* and *9* show the projected fertilizer price trend for 2007 in Alberta. Overall, AAFC forecasts that fertilizer prices will increase by 3.8% for 2007 in Canada. However, this forecast is very tentative due to the high volatility of natural gas prices.

Fertilizer Usage

Using 23 years historical data, the elasticity for fertilizer demand with respect to seeded area was estimated to be 1.25 in Canada. On average, a 1% increase in seeded area results in a 1.25% increase in fertilizer use. In terms of the estimated elasticity and other factors such as seeded/harvested area and fertilizer price change, fertilizer usage for 2006 is estimated to decrease by 1% from 2005 and is forecast to increase by 1% in 2007 at the Canada level.

Farm fertilizer expenses include all costs associated with the purchase of fertilizer, including specialized application costs. In Canada, when the price and usage changes are considered together, fertilizer expenses are estimated to reach CAN$2.6 bln, in 2006, 2.7% higher than 2005. Fertilizer expenses are forecast to increase by 4.8% in 2007, due mainly to higher fertilizer prices.

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